

Global distribution of Mercury's neutrals from MESSENGER measurements combined with a tomographic method

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The MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) spacecraft entered orbit about Mercury on March 18, 2011. Since then, the Ultraviolet and Visible Spectrometer (UVVS) onboard this spacecraft has been observing Mercury's collisionless exosphere. We present measurements by MESSENGER UVVS of the sodium, calcium, and magnesium distributions that were obtained during multiple passes through the tail over a period of one month. Global maps of the exosphere were constructed daily from such measurements using a recently developed tomographic technique. During this period, Mercury moved towards the Sun from being about 0.44 astronomical units (AU) to approximately 0.32 AU from the Sun. Hence, our reconstructions provide information about the three-dimensional structure of the exosphere, the source processes for these species, and their dependence with orbital distance during the entire in-leg of Mercury's orbit.